Temporalis Fascia Graft Underlay Technique for Type (1) Tympanoplasty in Chronic Otitis Media

عملية ترقيع ثقب غشاء طبلة الأذن باستخدام اللفافة الصدغية بتقنية البطانة في التهابات الأذن الوسطى المزمن

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الخلاصة

خلفية البحث: عملية ترقيع غشاء طبلة الأذن هي عملية إغلاق ثقب غشاء الطبلة باستعمال مادة للترقيع. اللفافة الصدغية هي أكثر أنواع الانسجة استعمالا .

المنهجية: دراسة متوقّعة ضمّت اربعين (40) مريضا أُجريت لهم عملية ترقيع غشاء طبلة الأذن في مدينة الأماميين الكاظميين (ع) الطبية لمدة(18) شهر خلال الفترة من (كانون الثاني2011-حزيران2012) . كل المرضى الذين يشكون من التهاب الأذن الوسطى المزمن تم تقييمهم قبل وبعد إجراء العملية سريرياً، شعاعياً وسمعيا في شعبة الأنف والأذن والحنجرة .جميع المرضى تم إجراء العمليات لهم تحت التخدير العام حيث استعملت اللفافة الصدغية كمادة ترقيع في كل الحالات. عند انتهاء فترة المتابعة (4-6شهر)، نجاح عملية الترقيع وتحسن السمع عند المرضى يعتبر معيار للنجاح.

النتائج: سلسلة من أربعين(40) مريضا من الذين أجريت لهم عملية ترقيع ثقب غشاء طبلة الأذن. نسبة النجاح لعمليات ترقيع ثقب غشاء طبلة الإذن بصورة عامة كانت (85%) .في حين كانت نسبة النجاح في حالة الثقب الصغير (100%) .أما في حالة الثقب الكلي فكانت نسبة النجاح (75%) ، كذلك وجد أن نسبة النجاح في حالة الثقب الموجود في الجهة الخلفية من غشاء الطبلة كانت عاليه (91.6%) .أما في حالة الثقب في الجهة الاماميه من الغشاء فكانت (83.3%). تم اختيار المرضى بغض النظر عن فعالية المرض مع استثناء كل المرضى الذين لديهم (لؤلؤة الأذن،انفصال أو التصاق العظام السمعية، تحبب الأنسجة أو فقدان سمعي أكثر من (40 دسبل) . تم مناقشة وجود أو عدم وجود عملية إضافية(استكشاف عظم النتوء الحلمي) على نتائج ترقيع طبلة الأذن

الاستنتاج: ترقيع غشاء طبلة الأذن من النوع الأول باستخدام اللفافة الصدغية هي عملية فعالة لغلق ثقب الغشاء وبنسبة نجاح 85%.

التوصيات : ترقيع غشاء طبلة الأذن باستخدام مادة ترقيع أخرى واستخدام تقنية جراحية جديدة يمكن إجرائها.

Abstract

Background: Myringoplasty is a procedure used to seal a perforated tympanic membrane by using a graft material; temporalis fascia graft was most commonly used.

Objective: To study the success rate ofmyringoplasty operation to close tympanic membrane perforation.

Patients and Methods: A prospective study of (40) selected patients with tympanic membrane perforation had undergone myringoplasty in Al-Imamain Al-Kadimain medical city over a period of (18) months (January2011-June2012). Preoperative and postoperative examinations of the patients were done clinically, radiologically and audiologically. All cases operated under general anesthesia and temporalis fascia graft was usedin all cases. At the end of follow up period (4-6) months, an intact graft and hearing improvement considered a rule ofsuccess.Data was analysiedby chi-squre (X^2).

Results: Generally from the whole number (40) patients whom undergo tympanoplasty type-1(myringoplasty), the success rate was (85%). With small perforation the success rate was (100%) while in total perforation was (75%). Also we found that the success rate in posterior perforation was high (91.6%) in comparison to the anterior perforation (83.3%).The patients were selected despite activity of the diseased ear with exclusion of all patients who had (cholesteatoma,ossicular dislocation or adhesion, granulation tissue and those with hearing loss of more than 40dB. Discussion was made with the presence or not of other procedures (exploration of mastoid bone) and its effects on the results of myringoplasty.

Conclusion: Temporalis fascia graft underlay technique of type-1 tympanoplasty is an effective method for closure of tympanic membrane perforation with a success rate of (85%).

Recommendation: Sealing of perforated tympanic membrane by using other types of graft materials and other surgical procedures can be done.

Key words: Tympanoplasty type (1), underlay technique, temporalis fascia graft.

INTRODUCTION

From the seventeenth to the nineteenth century, several attempts at closing tympanic membrane perforations using prosthetic materials were made, culminating in the "paper patch" technique developed by Blake in 1887.(1)

The surgical repair of permanent tympanic membrane perforations was first attempted at the same time as the paper patch technique but did not produce adequate results until 1952, when Wullstein

published a method of closing perforations with a split-thickness skin graft. Only a year later, Zöllner described his experiences with a similar graft. At the same time, Wullstein and Zöllner introduced the use of the operating microscope, significantly enhancing surgical results by improving the accuracy of the technique. In 1958, Heermann began to use temporalis fascia. In 1960, Shea described the closure of tympanic membrane perforations using a vein graft. In the 1960s and 1970s, homograft (cadaveric) materials, including tympanic membrane, dura, and pericardium, among others, were used with varying success. [(2)]

The operative technique also have changed with time, although the original onlay method is still practicised there has been progressive swing over years towards the underlay technique which is introduced by Austin and Shea (1961) and later modified and improved by Hough (1970).[(3)]A persistent hearing loss may be caused by cochlear dysfunction and ossicular disruptions, which contribute to the hearing loss, caused by the perforation and are not addressed by the myringoplasty. A small perforation with a large audiometric air–bone gap likely reflects an ossicular chain problem and will most likely require correction by tympanoplasty.[(4)] Not every perforation needs to, or should be closed. Each patient must be managed in accordance with what is best for that patient. An elderly or debilitated patient with an asymptomatic perforation, or a patient with a perforation in an only hearing ear, is not a good surgical candidate.[(5)]Myringoplasty is indicated for patients with history of intermittent infections as the successful closure of perforation abolish or greatly minimizes future activity. The aim of middle ear surgery for hearing is reduction in the patient's hearing disability (closure of the air-bone gap).[(6)] The presence of cholesteatoma is an absolute contraindication for a myringoplasty. Active chronic otitis media with otorrhea refractory to medical management indicates the presence of an infectious focus, which needs to be surgically addressed prior to repair of the tympanic membrane.In a young child with poor ear ventilation, it is unwise to repair the tympanic membrane until it is apparent that eustachian tube function has significantly improved.[(7)]

Objective: To study the success rate of myringoplasty operation to close tympanic membrane perforation.

PATIENTS AND METHODS

A prospective study of 40 patients (40 ears) selected with persistent tympanic membrane perforation that were repaired in the ENT department in Al-Imamain Al-Kadimain medical city during (18)months period(January2011-June2012) with a follow-up period of (4-6) months. This analysis covers not only the repair of tympanic membrane but also the cases in which other procedure (mastoid bone exploration) is performed simultaneously.

- **Inclusion criteria:** Persistent tympanic membrane perforation, unilateral tympanic membrane perforation, Patients age (20-40) years with hearing loss of 40dB or less.
- **Exclusion criteria:** Patients With cholesteatoma,Ossicular pathology (erosion or fixation),granulation tissueandthose with eustachian tube obstruction.
- **Site of Perforation:** were divided into four types, subtotal when the damage affect most of the eardrum, anterior when the damage anterior to the handle of malleus, posterior when the damage posterior to the handle of malleus and inferior when damage inferior to the umbo.
- **Size of perforation:** The perforations also divided according to their size by using Griffin classification into small (< 25%), medium (25%-50%), large (50%-75%) and subtotal (>75%) of tympanic membrane size respectively.
- **OtoRhinoLaryngological examination:** Examination of both ears by inspection, Otoscopic and microscopic examination.The contralateral (normal) ears is also carefully examined. The perforation (site, size), Presence of cholesteatoma,status of the annulus and the ossicles. Examination of nose, post-nasal space and pharynx.
- **Audiological tests**: including;tuning fork (Rennie and Weber tests)**,** Pure tone audiometer for conductive or sensorineural deafness.

- **Tubal function**:Tympanometry is performed with both Valsalva and Toynbee. Good aeration of the opposite ear may serve as an indicator of good tubal function.
- **Investigation:** Swabs taken from active ears for culture and sensitivity. Radiology (including computed tomography).
- **Postoperative Care:** Patients given systemic antibiotics (parenteral ceftriaxone 1 gram daily) for five days.The patients discharge occurs the day after surgery and the mastoid dressing is removed after twenty four hours. Aural antibiotics are given for another five days. Stitches removed after (7) days.The BIPP wick is removed after (6) days. The first postoperative check is at time when Gelfoam is removed (usually after six days). An audiogram is accomplished after one month and the patients instructed to recheck for (4-6) months.
- **Stastical analysis**:
    - All values were presented as mean ± standard deviation.
    - P value equal to or less than 0.05 considered significant.

  Data was analysied by chi-squre (X^2). Test was used to evaluate the association between categorical variables to determine whether association was significant. The P value was calculated for the results as follows:Significant when the P value is <0.05,and not significant when the P value is >0.05.

RESULTS

Table 1 (Mean, Standard Deviation and P. value of patients age).

Age `(mean±SD) years	No.	%	Success take rate	%	Failure take rate	%	P. value
20-30 (24.3±2.66) years	26	65	23	88.5	3	11.5	0.4
31-40 (34.8±2.7) years	14	35	11	78.6	3	21.4	
Total	***40***	***100***	***34***		***6***		

This table shows that the age of the patients ranged from (20-40) years. Patients in the age group of (20-30) years had better success rate (88.5%) while those with the age group of (31-40) years had a success rate of (78.6%).The P value was 0.4(i.e not significant).

Table 2 (Take rate and gender of the patients).

Gender	No.	%	Success	%	Failure	%	P value
Males	24	60	20	83.3	4	16.7	o.7
Females	16	40	14	87.5	2	12.5	
Total	***40***	***100***	***34***		***6***		

This table shows that male: female ratio (3:2). Regarding Sex predilection in this study we found no significant difference of graft take rate between males (83.3%) and females (87.5%).The P value was 0.7(i.e not significant).

Table 3(Take rate and side of the perforation).

Side of the disease (the perforation)	**No.**	**%**	**Success**	**%**	**Failure**	**%**	**P value**
Right ear	22	55	19	86.36	3	13.6	0.78
Left ear	18	45	15	83.33	3	16.7	
Total	***40***	***100***	***34***		***6***		

Table 3 presented that (55%) of the patients present with right side perforation. The success of graft take rate with right ear was (86.36%) while with left ear was (83.33%). P value 0.78(i.enot significant).

Table 4 (Take rate and size of perforation).

Size	No.	Success	%	Failed	%	P value
Small (<25%)	6	6	100	0	0	0.0005
Medium (25-50%)	16	14	87.5	2	12.5	0.00002
Large (50-75%)	10	8	80	2	20	0.0073
subtotal (>75%)	8	6	75	2	25	0.0455
Total	40	34		6		

Table 4 reveals that the size of the perforation classified according to Griffin classification into Small perforation (<25% of the size of tympanic membrane) which had a higher graft take rate (100%). The p value was 0.0005(i.e significant).

Table 5(Take rate and site of perforation).

Site	No.	Success		Failure		P value
		No.	%	No.	%	
Anterior	6	5	83.3	1	16.7	0.0209
Posterior	12	11	91.6	1	8.4	0.00004
Inferior	14	12	85.7	2	14.3	0.0002
subtotal	8	6	75	2	25	0.0455
Total	40	34		6		

This table shows that the posterior perforation had the highest success graft take rate. *Thep value was 0.00004(i.e significant).*

Table 6(Take rate and type of operative procedures).

Type of operation	No.	Failed	%	success	%	P value
Only Myringoplasty	12	2	16.6	10	83.4	
With cortical mastoidectomy	28	4	14.3	24	85.7	0.84
Total	40	6		34		

This table shows that there was no significant effect of addition of other procedure (i.emastoidectomy) on the success rate of myringoplasty. Myringoplasty plus mastoidectomy had a success rate of (85.7%), while those without mastoidectomy had (83.4%).*The P value are 0.84(i.enot significant).*

Table7(Take rate and the middle ear activity).

Middle ear activity	**No.**	**%**	**Success**	**%**	**Failure**	**%**	**P value**
Active	17	42	14	82.3	3	17.7	
Inactive	23	58	20	87	3	13	0.68
Total	***40***	***100***	***34***		***6***		

This table shows that in this study there is little impact of activity of middle ear state on success rate. Active ears had a successful rate of (82.35%) while inactive ears had successful rate of (87%). *P value was 0.68 (i.enot significant).*

Table 8(Graft taking rate).

Graft taking rate	No.	%
Successful closure	34	85
Failure of closure	6	15
Total	*40*	*100*

This table shows that (85%) of whole the patients underwent myringoplasty had a successful closure of a perforation while (15%) of theme had failure of closure.

Table 9 (Closure of air-bone gap).

preoperative			Postoperative		
Air/bone gap	No.	%	Air/bone gap	No.	%
0-10 (8)dB	1	2.94	0-10 (6.54±2.7) dB	11	32.35
11-20 (15.25±2.9)dB	4	11.76	11-20 (15.7±2.9) dB	18	52.94
21-30 (25.3±2.8) dB	11	32.35	21-30 (25.2±3.56) dB	5	14.7
31-40 (35.3±2.8) dB	18	52.94	31-40	0	0
Total	34	100	Total	34	100

This table shows that routine pure tone audiometery was carried out pre and postoperatively. Numbers and percentages of patients achieving various degrees of closure of air/bone gap(in ears with successful grafting) by calculating the average gap thresholds obtained at the speech frequencies(500,1000,2000,4000) Hz pre and postoperatively. Preoperative mean gap thresholds of (34) patients was 25.35 dB and postoperative was 14.13 dB, so the mean hearing gain was 11.22 dB.*TheP value was <0.05(i.esignificant).*

DISCUSSION:

In this study the patients who did myringoplasties were divided into (2) groups, those aged (20-30) years and those with (31-40) years. Patients in the age group of (20-30) years had a success rate of (88.5%) while those with age (31-40) years had a success rate of (78.6%). Delwar et al found better success rate with advancing age.[8]Zakaria et al also found higher success rate with advancing age.[11]They concluded that tympanoplasty before the age of 8ys result in a high rate of failure because of poor eustachian tube function and frequent upper respiratory tract infections. Demirpehlivan et al reported that the age has no influence on a success rate.[14] Regarding Sex predilection in this study we found that there were no difference of success rate of myringoplasty between males (83.3%) and females (87.5%). Mani et al also found no significant difference in graft take rate between male (85.7%) and females (81.8%).[12]Regarding the Side of perforation in this study, we found that there is no much difference in the success of graft take rate between right ears (86.36%) and the left ear (83.33%). Nadol et al in their study concluded also that there is no significant effect of perforation side on the outcome of myringoplasty.[9]Ashfaq et al also found no influence of perforated side on graft take.[20] In relation to size of perforation, our study found that small perforation (<25% of the size of tympanic membrane) had a higher rate of graft take rate (100%). Wasson et al found that small perforation had better success rate than larger one.[18] Regarding to site of perforation, this study present that anterior perforation is less success take rate (83.3 %) than the posterior one (91.6%). Demirpehlivan et al in their study also found that anterior perforation has less success rate than other sites, as the technical problems arises with the anterior perforation for reaching the annulus.[14] In this study there was no significant effect of addition of other procedure (mastoidectomy) on the success rate of myringoplasty . Myringoplasty plus mastoidectomy had a success rate of (85.7%) while those without mastoidectomy had (83.4%). Webb BD et al published no significant difference in the success rate of graft intake when the myringoplasty operation combined with other procedure (i.e with mastoidectomy).[17]In this study there is little impact of activity of middle ear on success rate. Active ears had successful rate of (82.35%) while inactive ears had successful rate of (87%). Rahul Kawatra et al found no influence of the condition (active or inactive middle ear infection at the time of surgery) on the subsequent graft take rate.[10]Aslam et al found no influence of the state of the middle ear activity on the results of graft take rate (the take rate was 92.7% in the active ears and 93.1% in the inactive ears).[16] This was not the case in a study done by Sarkar et al ,they found that the percentage of take rate of(164) inactive ears was (91.4%) and(80.9%) in active ears.[19]In this study the success rate of myringoplasty was (85%). Wasson et al looked the outcome of (281) myringoplasties the closure rate was (97%).[18]Bluestone et al reported successful rate of (95%).[21] In this study the mean hearing gain was (11.22 dB). Kulak et al concluded that the mean hearing improvement was (8.1dB).[15]Ohamad et al in their study found the hearing gain was (8.0 dB).[13]The difference in hearing gain can be explained by our highly selected patients and by exclusion of all complicated cases and those patients who need ossiculoplasty.

CONCLUSION

Success rate of myringoplasty by underlay technique approach was high. Temporalis fasciagraft underlay technique for type 1 tympanoplasty was an effective method for closure of tympanic membrane perforation and there is no significant effect of middle ear activity on graft take rate.

RECOMMENDATION

Further surgical methods of closure and other types of graft materials can be used for repair of perforated tympanic membrane are required.

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